ATTITUDE AS PREDICTOR OF ACADEMIC ACHIEVEMENT OF SECONDARY SCHOOL PHYSICS STUDENTS' IN AGBANI EDUCATION ZONE

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Abstract

Students' continuous underachievement in physics has underpinned the efficacy of non-cognitive variables like students attitude in physics. Therefore, the purpose of the study was to investigate attitude as predictor of academic achievement of secondary school Physics students in Agbani Education Zone of Enugu State. An Ex-post-facto and correlational survey research design was adopted for the study. The population of the study was 2752 SS II Physics students' in Agbani education zone from 44 public schools. Purposive sampling procedure was used in selecting 275 Physics students comprising 144 males and 131 females from twelve selected schools in the Zone. Physics Attitude Scale (PAS) adapted from Sumeyye and Oktay (2020) and Students' Achievement Scores obtained from their promotion examination results of 2022/2023 academic session from the schools used were used for data collection. The instrument (PAS) was face validated by three experts and tested for reliability using Cronbach's alpha with the reliability index of 0.82. Data were analyzed using simple regressions. The results indicated that attitude relatively and significantly contributed 39% to the prediction of academic achievement of secondary school Physics. Based on these findings, it was recommended that students should develop positive attitude in physics. Teachers should adopt teaching strategies that would stimulate students' positive attitude in teaching Physics.

***KeyWords**:* Physics, Attitude, Gender and Academic achievement

Introduction

Physics is vital to a nation's technical advancement because it gives its people the means to do their daily tasks with efficiency. Physics is vital in many sectors, including technology, engineering, medicine, biotechnology, nursing, and agriculture. Consequently, in its national education policy, the Federal Republic of Nigeria (FRN, 2014) declared physics to be a basic subject that should be taught as integrated science from junior secondary school through senior secondary school and postsecondary institutions. The scientific study of matter, objects, and energy in a particular system or environment is known as physics (Onah, 2022). Every branch of science stems from physics, which is the most fundamental (Eryilmaz, 2016). According to Anyakoha (2016), physics is a natural science that involves the study of matter and energy and their

interactions. Physics is the study of natural phenomenon at its most fundamental levels and manner (Onah, 2022). Physics deals with the study of laws that determine the structure of the universe with reference to the matter and energy in the universe (Ike, 2014). Physics as the core subject taught in secondary school contributes to the cognitive development of the students. Physics is the most utilized basic science subjects in most technology and technology-based profession. This is because, physics, exposes the students to the true nature of the universe around them; and as well forms the basis for the nation's technological advancement and human resource development (Abubakar, 2012). Physics knowledge has contributed immensely to the production of tools and devices of tremendous advantage to the human race (Sani, 2012). This merely indicates that the enormous role Physics plays in the technological growth of any nation must not be undermined. Physics is the most basic of science and its concepts and techniques underlines the understanding of all other branches of science. The knowledge of physics facilitates our understanding of other disciplines; thorough understanding of quantum mechanics is necessary to chemists and material scientists since the structure of every atom in the universe is determined by quantum mechanics. Physics is also a cross-cutting discipline that has applications in many sectors for economic development, including health, agriculture, water, and energy and information technology. The knowledge of physics according to Gabriel (2012) offers the learners the opportunity to think critically, reason analytically and acquire the spirit of enquiry. The researcher also maintained that the knowledge of physics develops in students, the scientific and technological knowledge, skills and attitudes which will assist them to make decisions based on the observation and experimentation. Particularly, in our world developing with technological changes, the place of physics and its applications is quite important. The discovery in Physics led to the discoveries of valuable devices like computers, lasers, transistor etc. these devices has been found paramount to the development of technological science (Onah & Achufusi, 2022). Notwithstanding, the numerous benefits of physics especially in the development of science and technology; students find physics concepts boring and difficult owing to the composition of mathematical processes. These students especially those in the secondary schools, argue that physics is abstract.

Interestingly, as important as physics is, students' academic achievement and attitude in the subject at secondary school and institution of higher learning has not been encouraging. In Nigeria, there has been a recurring unacceptable attainment of students in physics. Record of students' performance at Senior School Certificate Examination (SSCE) in physics conducted by West African Examination Council (WAEC) according to Adolphous (2018) shows that between 2001 and 2009 (except in 2006), less than 50% of the students who enrolled for physics obtained credit level pass and above to secure admission into the university in order to pursue courses that require physics. The researcher also stressed that the failure rate continued from 2007 to 2009 (42.9%, 47.1% and 46.2%) and in 2013 (46%) with an improved achievement in 2010, 2011 and 2012 (50.2%, 62.6% and 67.2%). According to Onah and Achufusi (2022) the failure trends

continued in 2015, 2017; and 2020 (47.83%, 41% & 36% respectively) with an improved achievement in 2016, 2018; and 2019 (71%, 87% & 80% respectively). In general, this cannot be considered an acceptable achievement as many have lamented that achievement of Nigeria students in physics at the Senior School Certificate Examination (SSCE) has been generally not so good (Adaramola & Obomanu, 2011). Even the WEAC chief examiners (2019), report that this poor achievement of the students' could be linked to their poor attitude in the subject. They suggested as well that teachers should teach students with students' centred approach to enhance their attitude in physics. They also suggested that teachers should attend coordination during WAEC marking to decipher viable methods to enhance students' attitude. According to Okigbo and Okeke, (2011) who observed that students' poor attitude has been traced to their anxiety and fear in the subject which was evident in their poor achievement.

The students' poor achievement in physics in particular and sciences in general has been attributed to many factors. These include; poor methods of physics instruction by the teachers, insufficient number of qualified physics teachers, lack of indigenous textbooks, inadequate apparatus in the physics laboratory, poor classroom management by physics teachers, teacher's belief and attitude towards physics, physics teacher's inability to improvise, inadequate instructional materials and aids, educational background and parental expectations on the learners and finally students' related factors or variables like students' academic anxiety, academic self-efficacy, academic locus of control, academic motivation and more (Adedayo & Jegede, 2013 pg 80-83). This study therefore, is set to find out the predictive power of students' attitude on their academic achievement in Physics.

Attitude is a psychological construct or feelings inferred for a given observable. Attitude is referred to as entry characteristics of the students towards a given concept or subject. Attitude is related to thinking, feeling, perceiving, liking and behaving toward a cognitive observable. Attitude is a tendency to react favorably or unfavorably towards a designated subject matter. According to Olasehinde and Olatoye (2014), attitude is the tendency of liking or reacting favorably or unfavorably towards an event of observation. An academic attitude involves learning to trust your own critical abilities and being assessed on your own achievement and performance. A student's attitude is their tendency to respond in a certain way towards something. Naturally, the student's response can be on a continuum of positive to negative or good to bad. When a teacher says that a student has a bad attitude, they mean that the student did not respond positively to something they were asked to do. The opposite is also true; a student with a good attitude is likely someone who has a cooperative spirit in terms of complying with what they are asked to do by the teacher. Attitude does not only include the negative attitude such a prejudices biases and dislikes, but also positive attitudes are sometimes called sentiment, which include our attachment and loyalties to person, objects and ideas. Attitude thus seems like a system of ideas with an emotional content. An individual possesses his or her life, he or she acquires not only skills and knowledge, but also definite attitudes, point of views and feelings about

his or her experiences. These definite attitudes, point of views and feelings are developed not only due to what kind of experiences the individual passes through, but also how these experiences came across. A person with positive attitude towards a concept will consciously or unconsciously thinks, demonstrate traits of innate liking for the concept (Olatoye & Aderogba, 2012). The contemporary theorists (Osgood & Tannenbaum, 1957), on attitude carved out three components of attitude as personal or dispositional attitude, situational attitude; and social information attitude. The dispositional attitude is viewed as an attitude that is almost the same as a personality trait. Students are born to have a positive or negative outlook in different situations. In other words, if they are happy, they are happy, and if they are sad, they are sad. From a teaching perspective, it is a random chance whether a student will enjoy the teacher's class or not. This is not overly optimistic in terms of changing a student's viewpoint, while situational attitude is the kind of attitude that emerges depending on the context of the situational affiliation of the subject. For example, if students struggle to understand physics by virtue of its mathematical concepts, they may develop a negative attitude about physics through mathematics all together. However, the opposite is also true in that success will cause the development of a positive attitude. Or by the use of ineffective teaching material, may as well make the students feel bored about the subject. This view allows a teacher to try to find situations in which students can have success and good attitude so that they can inculcate a positive attitude. Lastly, the social information processing attitude views attitude as those attributions that emanate from friends and associates interference. It is also viewed as attitudes caught from the people around us. For example, if a student with a neutral (naive) attitude is surrounded by students with negative attitudes, they also will develop a negative attitude, the opposite is also true. As well, a student may hate a subject simply because his friend does not like the said subject. Students pick up on the information about various topics from the environment, which can largely shape their attitude towards something. Attitudes determine how an individual thinks, feels or reacts towards an object. If students have better attitude towards an object or subject, it is easier to lead them towards desirable objectives. According to an observation by Bansal (2017), bad instructional strategies that do not promote meaningful learning and tend to make students develop negative feeling and behavior towards learning materials has negative toil on their achievement. This is because as negative attitude is known to affect students' involvement in learning and achievement (John, 2014). As innovative instruction provides concrete examples and engages students in learning process, it is expected to have positive influence on students' attitude. Onah and Anamezie (2022), opines that if teachers show weaknesses in their knowledge of the subject, this might create a lack of confidence in students about the teachers' abilities and knowledge. The effect of this among others is that a student may become less attentive and develop negative attitude towards both physics as a subject, and the teacher. Attitude in Physics is viewed/ considered under the following factors:

- Motivation factor: this represents how much of an effort the student puts in while learning physics. This usually comes from situational construct of classroom

instructions. It includes reinforcement, use of suitable teaching pedagogy and conducive learning atmosphere.

- Anxiety about physics factor: this represents how the student feels/ fears when learning physics. It can be linked to teacher's inability to demystify difficult contents of physics.
- Interest in physics courses factor: this represents what the student likes/ thinks about physics courses. It requires the ability of the students to have innate liking for physics subject.
- Self-sufficiency factor: this represents the student's confidence in his/her skills in physics.
- Anxiety about mathematics factor: this expresses how the student feels when he/she has to use mathematical expressions during physics courses.

These potentials of attitude incites the need for further investigation into the predictive power of attitude and whether they could improve the achievement of male and female students in physics irrespective of gender.

Gender has been noted by researchers over the years as having an impact on achievement in Physics and its related disciplines. Akumah, (2013) stressed that science, technology, and their related disciplines are male-reserved while Art and Humanities are female reserved. This belief makes boys appear to have a naturally positive attitude towards science and technical subjects while girls show more inclination to Arts and Humanities. The problem is even compounded by the fact that most science educators give masculine outlook to science subjects such as chemistry and physics, this discrepancy was evident in the students' achievement in Chemistry (Ezeano, 2013); encouraging females to go rather for biology, agricultural science and home economics which they consider to be more female-friendly science subjects. Some other researchers (Onah & Achufusi, 2022, Nwankwo & Okoye, 2015; Orefor, 2016) opined that gender has no influence on students' achievement in the sciences. All these and related treatments make girls have phobia for science and science-related subjects which definitely affect their future career-choice and eventual achievement. Due to lack of consensus regarding the issue of gender and science and more importantly to capture the interest of girls, and consequently improve their achievement in physics and other science-related carriers, there is a need therefore, to investigate the predictive power of attitude on achievement of male and female students in the sciences especially Physics.

Statement of the Problem

The problem of poor attitude in science subjects especially Physics is no longer news in the teaching and learning of physics. Researchers and physics teachers have ever since been seeking ways to bring the attitude of students to an appreciable extent. This stands to be a great challenge facing the education system in Nigeria. Although many other challenges such as quality of science teachers, lack of science equipment, poor

incentives among others have over time been queried, further investigations still have to be carried out especially using students since they are the primary factors here.

These factors have over time resulted to gross poor attitude in physics which often lead to low enrollment in the subject especially the females. This situation is causing a lot of concern to science educators. There is considerable evidence in literature to show that traditional physics instruction, predominantly based on lectures and manipulation of formulae to teach a concept is ineffective. It is against this backdrop and quest for better ways of providing effective teaching and learning of physics concepts that the researcher is motivated to embark on the present study. The problem of the study therefore, is "what is the predictive power of attitude on academic achievement of secondary school physics students' in Agbani Education Zone?

Based on the problem of the study, the study investigated the magnitude of prediction of physics students' achievement by their attitude among secondary school Physics students in Enugu Education Zone of Enugu State.

Specifically, the study sought to find the:

1. Prediction of students' academic achievement by their academic attitude in physics.
2. Moderating influence of gender on students' academic attitude prediction of academic achievement of physics students.

The following research questions were designed to guide the study in line with the purpose

1. What is the prediction of students' academic achievement by their academic attitude in Physics?
2. What is the moderating influence of gender on students' academic attitude prediction of academic achievement of physics students?

The following null hypotheses were formulated for the study; which was tested at 0.05 level of significance

1. There is no significant prediction of academic achievement by academic attitude of secondary school Physics students.
2. Moderating influence of gender on students' academic attitude in predicting their academic achievement in physics is not significant.

Method

The study employed an ex-post-facto research design incorporating both the correlation and qualitative approaches to interpret the results of the test of null hypothesis. The ex-post facto research design was chosen because the condition of the (independent variables) learners and the results had already occurred as is expected in such designs that do not manipulate any independent variable (Orodho, 2012). The correlational strand enabled the researcher to determine the relationship between variables through the use of

correlational statistics (Wenslaus, 2015). Orodho (2012) notes that in a correlational research, relationships among two or more variables are studied without any attempt to influence them. Orodho (2012) and Brooks (2013) contend that a major purpose of ex-post-facto research design of a correlation subtype is to clarify an understanding of important variables that have already occurred through the identification of relationships among the variables. The study was carried out in Agbani Education Zone, located East of Enugu State, Nigeria. Enugu State has six Education zones which include: Enugu, Awgu, Agbani, Nsukka, Obollo-Afor and Udi. Agbani Education zone consists of three local government areas; namely: Enugu South, Nkanu East and Nkanu West local government area. The area has the first indigenous tertiary institution of the state which is Enugu State University of Science and Technology, Agbani (ESUT). The area is predominantly semi-urban in nature with basic amenities such as good road, hospitals, electricity, schools and markets. Most people living in the zone were civil servants, students, traders and many farmers. The researcher chose Agbani Education Zone due to the fact that most of the secondary schools have qualified physics teachers, laboratories and instructional materials and yet students experience difficulties in answering questions in physics in their external examinations which was evident in their final achievement scores and grades in WAEC results hence the need for the study in the area. Therefore, this research will help the teachers to integrate academic attitude which will in turn enhance good academic achievement. The population for the study was 2,752 SS2 Physics students from 44 public secondary schools in the zone. Two hundred and seventy-five (275) SS2 physics students (144 males & 131 females) drawn through multi-stage sampling approach from twelve co-educational secondary schools in Enugu South and Nkanu West Local Government Area of Enugu State were used for the study.

In stage one, simple random sampling technique (precisely by balloting) was used to select Enugu South and Nkanu West Local Government Areas. In second stage, purposive sampling was used to select twelve co-educational schools in the two local government areas based on the existence in those schools of well-equipped physics laboratories and experienced physics teachers with teaching qualification. Simple random sampling technique (precisely balloting) was next used to select 275 students.

The instruments used for data collection was the Physics Attitude Scale (PAS) adapted from Sumeyye and Oktay (2020). PAS comprises 20 items adapted from a 21-item Physics Attitude Scale developed by Sumeyye and Oktay (2020). Originally, the scales are for students' general attitude scale for physics students but were modified because one item repeated itself. It is a four point scale, ranging from 1 = strongly disagree to 4 = strongly agree, which was used for all items in this instrument. 5 question items had negative cue in the instrument, precisely 5, 6, 7, 20; and 21. These negatively cued items were reverse-scored before the scores were computed at the analysis stage.

The instrument (PAS) was face validated by three experts and tested for reliability using Cronbach alpha which yielded a coefficient of 0.82. Physics academic Achievement scores were extracted from the students' promotional examination of

2020/2021 academic session. The variable of academic achievement is an interval scale. A student's achievement score is lower or higher than another. The research questions and hypotheses were answered/ tested using multiple linear regression analysis. If the p-value is less than 0.05, then the null hypothesis will be rejected and accept alternative hypothesis but if it is greater than 0.05, the null hypothesis will not be rejected.

Results

Research Question 1: What is the prediction of students' academic achievement by their academic attitude in Physics?

Answer to Research question 1 is presented in Table 1

Table 1: Moderated multiple regression analysis on Academic Achievement

Model Summary

Model	R	R Square	Adjusted R Square
1	.624[a]	.389	.385
2	.628[b]	.394	.388

Table 1 shows that the independent variable (attitude) as seen in model 1, has significant influence on the academic achievement of the students with the value of R^2 = .389 and adjusted R^2 = .385, it implies that the independent variable; attitude contributed approximately 39% prediction of academic achievement of Physics students.

Research Question 2: What is the moderating influence of gender on students' academic attitude prediction of academic achievement of physics students?

Answer to Research question 2 is presented in Table 1

Table 1 shows that the independent variable (attitude) as seen in model 2 of the model summary table showed addition of the moderator variable (gender) to the predictor variable made significant contribution to the prediction of students' academic achievement (R^2 = .394) and adjusted R^2 =.388, it implies that academic attitude contributed approximately 39% when moderating gender.

Hypothesis 1: There is no significant prediction of academic achievement by academic attitude of secondary school Physics students in Agbani Education Zone.

Table 2: Relative Contribution of Physics Academic Attitude to the prediction of their academic achievement in Physics

Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	95.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
1 (Constant)	14.555	3.923		3.710	.000	6.831	22.278
Gender	.070	.793	.004	.088	.930	-1.491	1.631
Attitude	.784	.060	.624	13.159	.000	.667	.901
2 (Constant)	31.178	11.417		2.731	.007	8.700	53.656
Gender	-11.416	7.453	-.683	-1.532	.127	-26.090	3.257
Attitude	.516	.183	.411	2.823	.005	.156	.876
Gender*Attitude	.185	.120	.718	1.550	.122	-.050	.421

Table 2 shows the unstandardized coefficients with t- and p-values of the predictor and the moderator variables respectively. The table showed that the independent variable made a significant contribution to the prediction of physics academic achievement. Considering the extent of contribution, attitude, the un-standardized coefficient (B = .784) and standardized coefficient or slope (= .624) was significantly different from 0.000 (t = 13.159; P < 0.05). This indicates that for every one point increase in students' academic attitude, their academic achievement increased by 78/100 when controlling gender. Therefore, null hypothesis was thus rejected. There was statistical significant contribution of students' attitude to the prediction of their academic achievement in Physics.

Table 3: Analysis of Variance on the Moderated Multiple Regression

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7465.325	2	3732.663	86.613	.000[b]
	Residual	11722.115	272	43.096		
	Total	19187.440	274			
2	Regression	7568.308	3	2522.769	58.840	.000[c]
	Residual	11619.132	271	42.875		
	Total	19187.440	274			

Table 3 showed the output of **ANOVA** on the moderated multiple regression. It shows in model 1, F (2, 272) = 86.613; P < 0.05. This added weight for the rejection of the null hypothesis. Hence, the independent variable (attitude) significantly predicted academic achievement of Physics students.

Hypothesis 2: Moderating influence of gender on students' academic attitude in predicting their academic achievement in physics is not significant.

Table 2 shows the moderating effect of gender on attitude, the un-standardized coefficient (B = 0.070) and standardized coefficient (= .004) was not statistically significant different from 0.00 (t = 0.088; P > 0.05), thus the null hypothesis was not rejected. Therefore, moderating influence of gender on students' academic attitude in predicting their academic achievement in physics is insignificant. More so, the interaction effect of gender and attitude shows insignificant with the un-standardized coefficient (B = .185) and standardized coefficient or slope (= .718) was not significantly different from 0.000 (t = 1.550; P > 0.05). Therefore, there is no significant interaction of gender on attitude in predicting physics students' academic achievement.

Discussion

The finding of the study showed that there is a significant prediction power between the attitude of the students and their achievement in physics. This implied that students who possess good attitude in their learning of physics will have better achievement. When the students are properly developed in their attitude in physics it will give them a good motivations, self-sufficient, interest in physics and liking that will enable them function effectively in physics knowledge and classroom experiences. Therefore, the level of attitude development that the students have will affect their achievement in physics. This find is in line with the Ojo (2019), Olasehinde and Olatoye (2014) and Luzale (2012), Okafor, (2020), Awodun *et al* (2013), Kpolovie et al (2014), Femi-Adeoye and Adekunle (2016) and Ezike (2018) who found out that attitude of the students enables them to remember concept taught in physics by reading the context regularly and consequently aided their improved academic achievement.

The gender has no implication on the attitude of the students and their achievement in physics. The study showed insignificant difference in the prediction of academic achievement with gender interaction. The study was in line with the findings of Padmini (2017), Godpower-Echie and Ihenko (2017), Okafor, (2020) who also observed no gender difference in the relationship with attitude with students' learning outcomes. The study also disagreed with Ezike(2018), Awodun et al (2013) who observed significant different with gender in the relationship between gender and their academic achievement in physics. It is obvious that there is no agreement in the research community concerning the interaction effect of gender and cognitive learning skills and attitude in Physics on students' conceptual understanding of science especially physics concepts and achievement. The differences in observation by different researchers could be attributed to the influence of location and some other extraneous threats to the experiment. There is therefore a great need to embark in more studies in order to shed further light on this issue.

Conclusion/Recommendations

Based on the findings, the study concludes that development and use of attitude will go a long way in improving academic achievement in physics among secondary school students with regardless of gender. It was recommended that teachers should challenge the students with learning materials that will encourage them to develop good attitude. Schools authorities should engage the services of guidance and counselors that will help students to know how to improve their attitude and apply them to achieve their learning needs. More so, Physics teachers should arrange learning activities in such a way that it will help students to be self-directed, self-sufficient in their learning which will help them apply all the attitude both personal, situational and socio information attitude in the learning of physics.

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